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REMARKS

This is in response to the Office Action dated December 31, 2002. In view of the foregoing amendment and following representations, reconsideration is respectfully requested.

Initially, filed concurrently herewith, is an "Information Disclosure Statement" (IDS). The relevance of the cited references are discussed below. The Examiner is requested to kindly acknowledge the filing of the IDS.

Also, as required by the Examiner, the title of the invention has been amended to clearly indicate the invention to which the claims are directed.

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Next, on pages 2-3 of the Office Action, claims 8-11, 13-15, 18, 21, 29, 31, 32 and 33 are rejected under 35 U.S.C. 112, second paragraph.

In response to this rejection, claims 29, 31 and 33 have been canceled, and claim 18 is amended.

As in the previous responses, Applicants unequivocally state that the claims are directed to the apparatus as clearly stated in the preamble of the independent claims, which recite "A component mounting apparatus". Also, the body of each of the claims sets forth a number of interrelated structural elements. Accordingly, it is again stressed that there is no question that the claims are directed to the apparatus. Note that the recited structure in claims 8 and 18 is defined in part by the capabilities thereof.

Further, in the rejection, the Examiner identifies functional language in claims 10, 11, 18, 29, 31 and 33 which the Examiner contends renders the scope of the claims unclear.

In response, it is noted that the use of functional language to claim an invention is specifically approved by statute, the patent Office and the courts. The idea that functional language cannot ipso facto precisely define novelty in structure was laid to rest in In re Swinehart 169 USPQ 226 (Fed. Cir. 1971). In this regard, the Examiner's attention is directed to MPEP 2173.05(g), which specifically states that there is nothing wrong with defining some part of an invention in functional terms. This section of the MPEP further instructs that a functional limitation must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used. This section of the MPEP also explains that a functional limitation is often used in association with an element to define a particular capability or purpose that is served by the recited element.

The inquiry to be made in determining whether a claim is definite under 35 U.S.C. 112, second paragraph, is whether those of ordinary skill in the art would understand what is being claimed. Amgen Inc. v. Chugai Pharmaceutical, Ltd., 18 USPQ2d 1016, 1030 (Fed. Cir. 1991).

With respect to claims 10 and 11, the language identified by the Examiner, merely specifies that the controller functions to control the first and second mounting head sections such that, when one mounting head sections is picking up components, the other is mounting components on a board. Clearly, one of ordinary skill in the art would

understand what is required by claims 10 and 11 particularly when read in light of the specification.

With respect to claim 18, the language identified by the Examiner is a common use of functional language. The language specifies that the component suction nozzles function to suck components. In an attempt to advance the prosecution of the present application, the language "for sucking" has been changed to --capable of sucking --.

Further, the Examiner notes an antecedent basis problem in claim 6. However, claim 6 is no longer pending in this application.

Further, the Examiner indicates that the "component supply table" in line 20 lacks antecedent basis. Accordingly, claim 18 has been amended to clearly refer to the component supply tables recited in line 2 of the claim.

Further, the Examiner indicates that the limitation "a plurality of components" in lines 22 and 27 should be changed to --the plurality of components--. A similar amendment has been made to claim 18 to indicate that a number of the plurality of components are picked up by the mounting heads. In particular, lines 22 and 27 are amended to recite that "more than one of the plurality of the components" are picked up by the mounting heads. This language accurately states that a number of the components are picked up from the supply (plurality) of components.

Accordingly, it is submitted that claim 18 is now clearly in compliance with the requirements of 35 U.S.C. 112, second paragraph.

In view of the above, it is submitted that the claims are clearly in compliance with the requirements of 35 U.S.C. 112, second paragraph.

Next, on pages 3-4 of the Office Action, claims 8-11, 13-15, 18-19, 22-26 and 28-34 are rejected under 35 U.S.C. 102(b) as being anticipated by Kamijima (U.S. Patent No. 5,002,448). Also, on page 5 of the Office Action, claims 20, 21 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamijima. These rejections over the Kamijima reference are traversed for the following reasons.

The present invention is directed to a component mounting apparatus that includes:

- (i) a head that is movable in two directions (X and Y directions), which are perpendicular to each other; and
- (ii) cassettes that are arranged in a direction that is parallel to the board transfer direction.

In particular, lines 10-13 of claim 8 require that "the first mounting head section is moved in first and second directions which are perpendicular to each other, wherein the first direction is perpendicular to a direction in which the board is transferred, and the second direction is located along the board transfer direction". Accordingly, claim 8 defines a head that can move back and forth in the first direction so as to move toward or away from component(s) located at component take-out position(s) at the component supply tables. Therefore, if a component is shifted from a predetermined position because of some attachment shift of the component supply table, the head is able to move back and forth in the first direction and then move toward or away from the component located at a component take-out position of the component supply table. Thus, the head can be positioned at the component take-out position to reliably and securely hold the components.

An important feature of the present invention is that the component mounting apparatus comprises a first mounting head section having a plurality of rotatably supported component suction nozzles, wherein the first head section can rotate the component suction nozzles for successively picking up the plural components at one of the component supply tables by suction, thereafter....the plural picked-up components can be successively mounted on a board.

Kamijima discloses a circuit board assembling device having a plurality of heads 31 which each have a plurality of gripping devices 18 comprised of a vacuum source 19 and pivotally supported gripping fingers 21. However, the gripping devices are arranged in a line and cannot be rotated, as required in each of independent claims 8 and 18. Therefore, since the Kamijima does not disclose or suggest each of the limitations of claims 8 and 18, the Kamijima reference cannot anticipate these claims under 35 U.S.C. 102(b).

Further, as shown in the attached explanatory figure, in the Kamijima device, when a component at the left end of the component supply section is sucked by a first nozzle H1 at the right end of the first head, the first nozzle H1 at the left end of the first head is moved to a position H1' at the left end of the component supply section and a third nozzle H3 at the left end of the first head is moved to a position H3'. Therefore, the whole length for driving the first head H1 must be increased by the length L' from the left end of the component supply section to the position H3', where the length L' is equal to the distance between the position H3' and the position H1'.

9 / Similarly, when a component at the right end of the component supply section of Kamijima is sucked by the third nozzle H3 at the right end of the first head, the third nozzle H3 at the left end of the first head is moved to a position H3". Therefore, the whole length for driving the first head must be increased by the length L" from the right end of the component supply section to the position H3". As a result, the whole length for driving the first head must be increased by the total of the length H3' and the length H3".

In contrast, in the present invention, the nozzles are rotatable, and thus the length H3' and the length H3" are not necessary, which results in a reduction of the apparatus length. Such reduction is most effective in the recent longer production lines where a number of component mounting apparatuses are connected to each other. If the longer line is used for mounting, the transfer length of the boards with several components mounted thereon is increased so as to cause mounting troubles such as component shifts. In the present invention, such mounting troubles can reliably be reduced because of the reduced transfer length of the boards.

Therefore, it is clear that the present invention, as defined in claims 8 and 18, provides significant advantages that cannot be realized with the Kamijima device. Accordingly, it is submitted that claims 8 and 18 are clearly allowable over the prior art of record.

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Further, as noted above, an information disclosure statement is submitted herewith. The following comments are provided for the Examiner's consideration.

Haan et al. (USP 4,875,285) discloses that a rotatable and displaceable multiple equipping head 1 is capable of moving in a range broadened between both sides of a rear portion of a board positioning area in a board transfer line. That is, Haan fails to disclose or suggest that a pair of component supply tables for accommodating a plurality of components are arranged on opposite sides of a board mounting position, which is defined in the present invention and thus the present invention is fundamentally different from the Haan device.

Since in Haan, the head 1 is supported so as to be driven forward and backward in the Y-axis direction of the XY-direction, the robot (carriage 6) for driving the head 1 is cantilevered and a component supply section is arranged at the rear portion of the board positioning area of the board transfer line. Therefore, the Y-axial stroke of the robot is increased and then such an increase needs to enhance the Y-axis drive-holding structure rigidity. In addition, the robot is driven in the X-axis direction, and thus, the rigidity of the Y-axis drive-holding structure must be further increased relative to an X-axis drive-holding structure. Therefore, the weight of the drive unit of the robot is remarkably increased, which makes it impossible to perform higher speed and higher accuracy mounting.

The provision of the component supply section at the rear portion of the board transfer line makes its workability and maintenance worse with respect to component supply and requires that the component supply section be widened, thereby resulting in an increased size of the component mounting apparatus.

EP 0 453 369 A1 discloses that a board is positioned in a Y-axis direction while mounting heads are positioned in an X-axis direction on both sides of the board mounting

position along a component suction line. Therefore, when large-sized components are mounted on the board, the board is moved in the Y-axis direction, resulting in a possible shift of the mounted large-sized components on the board. In order to prevent such shift, the board moving speed must be decreased, thus significantly increasing the mounting time.

In addition, the component suction line is arranged along the component mounting line, but actually, it is difficult to align the component suction line and the component mounting line relative to each other because the straightness is not zero, resulting in possible shifts between the lines, thereby causing shifts in the component suction positions and making small-sized component mounting unstable.

In contrast, in the present invention, the head can be moved in both the X and Y directions, and thus the component suction positions can be corrected in both directions to provide for stable component mounting. In addition, in the present invention, a pair of component supply tables for accommodating a plurality of components are arranged on opposite sides of a board mounting position, resulting in a reduction of the width of the component mounting apparatus.

JP 03-203294 discloses a mounting technique, which is similar to that disclosed in Kamijima, and thus, the difference between JP '294 and the present invention is the same as that between Kamijima and the present invention (described above).

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In view of the above, it is submitted that the present application is now clearly in condition for allowance. The Examiner therefore is requested to pass this case to issue.

In the event that the Examiner has any comments or suggestions of a nature necessary to place this case in condition for allowance, then the Examiner is requested to contact Applicant's undersigned attorney by telephone to promptly resolve any remaining matters.

Respectfully submitted,

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March 31, 2003

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IN THE CLAIMS:

Please cancel claims 29, 31 and 33 without prejudice or disclaimer of the subject matter recited therein:

Please amend claim 18 as follows:

18. (Four Times Amended) A component mounting apparatus comprising:
a pair of component supply tables for accommodating a plurality of components, said component supply tables being arranged on opposite sides of a board mounting position;

a first mounting head section for successively picking up the plural components at one of the component supply tables and thereafter successively mounting the plural picked-up components onto a board, positioned at the board mounting position, while moving in first and second directions which are perpendicular to each other,

wherein the first direction is perpendicular to a direction in which the board is transferred, and the second direction is located along the board transfer direction; and

a second mounting head section for successively picking up the plural components at the other of the component supply tables and thereafter successively mounting the plural picked-up components onto the board, positioned at the board mounting position, while moving in third and fourth directions which are perpendicular to each other,

wherein the third direction is parallel to the first direction, and the fourth direction is parallel to the second direction but is not necessarily the same as the second direction,

wherein each of the first and second mounting head sections is independently movable between one of the component supply tables [table] and the board,

wherein each of the first and second mounting head sections has a

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plurality of rotatably supported component suction nozzles capable of [for] sucking more than one of the [a] plurality of [the] components prior to a component mounting operation, and each of the mounting head sections is capable of rotating the component suction nozzles,

wherein the first mounting head section is capable of mounting the plural picked-up components onto the board while the second mounting head section successively sucks to pick up more than one of the [a] plurality of [the] components at the other of the component supply tables.